G31 Morphoanalysis of Bitemarks

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After attending this presentation, attendees will better understand the interest in using specific softwares to create overlays and to superimpose 3D images of bitemarks with those of the dental arches of the alleged biter.

This presentation will impact the forensic science community by demonstrating that bitemark analysis must be reliable at all levels. This study is a continuation of research that began several years ago regarding bitemark expertise in the forensic odontology department of the Forensic Science Institute of the French police force.

The identification of bitemarks must enhance the scientific aspect of expertise. There is no longer any reason to compare simple overlays created from photographs using software, which implies the operator's subjectivity. 3D digital imaging enables superimposition of overlays and virtual penetration into soft tissues, which leads to more accurate expertise. Accurate overlays can be generated by software that executes close cuts. This automated clipping enables a more reliable illustration of the contours of the teeth. Different experts were instructed to make identical overlays from the same dental arch. This technique eliminates the claims of lawyers and magistrates regarding the accuracy of drawings submitted for examination. The examination of virtual penetration of teeth into the tissues is performed using the same software that brings the analyzed 3D elements closer. In the long run, this examination should enable comparison of the bitemark morphology of the victim with the morphology of a virtual bitemark experimentally realized.

Materials and Methods: The use of a laptop is necessary and sufficient to perform real-time 3D image analysis and reconstruction and to store data and software programs. An optical camera is linked to this laptop by a USB port. The software is used to visualize the dental arches of a suspect and the bitemarks on the victim. The camera is used to scan the bites on the body of the victim and the teeth or dental casts of the suspect. Then, virtual cuts are made, cropped, and a superimposition is performed by placing overlays on each workable mark on the skin of the victim. These files can be sent/shared in Stereolithography (STL) or Polygon (PLY) files for further analysis.

Conclusion: The analysis of human bitemarks is often controversial in both national and international courts. Only an objective analysis using new digital technologies and secure protocols can make this type of expertise credible. Morphoanalysis of bitemarks using the materials and method described in this study represents real progress in the field of forensic odontology.

Bitemarks, 3D Digital Camera, Overlay

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